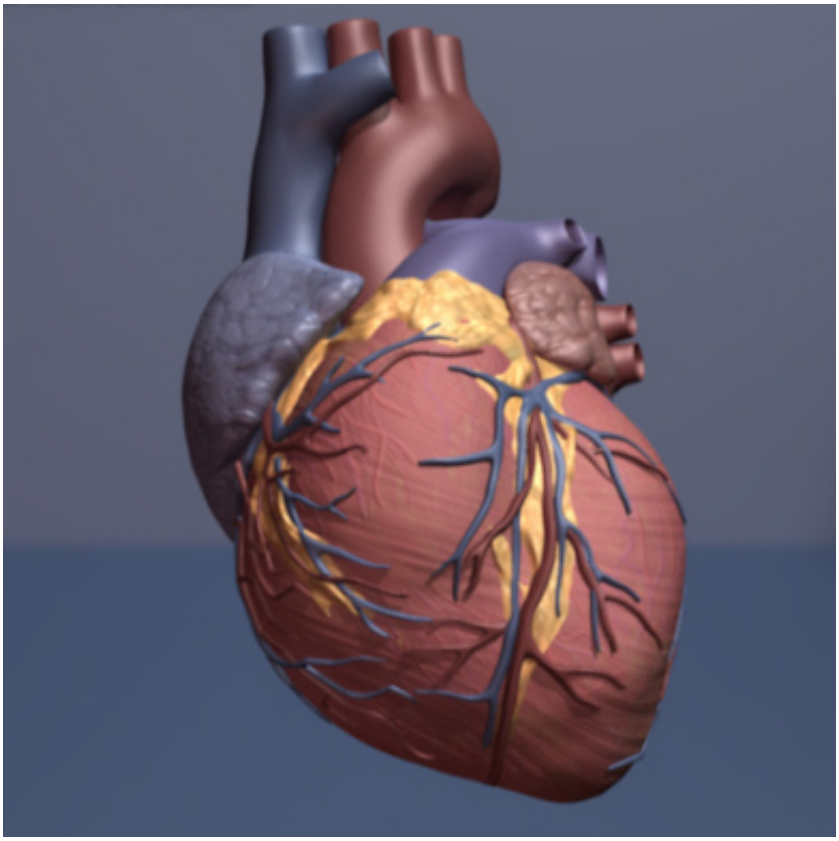
Bioeningeers create new virtual 3-D heart for clinical use

August 27 2018, by Tess Redgrave



Human heart. Credit: copyright American Heart Association

A team at the University of Auckland's Bioengineering Institute have created a virtual 3-D heart that could have a major impact on treatment of the most common heart rhythm disturbance, atrial fibrillation (AF).

Dr. Jichao Zhao and his international team have developed a very "intelligent" machine learning algorithm, alias AtriaNet, that can simultaneously utilise local and global information of whole-body MRI scans to accurately reconstruct and visualise atrial geometry in 3-D.

AtriaNet was developed using 154 three dimensional, contrast-enhanced MRI, (the largest dataset of its kind in the world), to separate atrial chambers from the rest of human body. AtriaNet can be run on a personal computer and produce a 3-D virtual heart within one minute from any new patient MRI with a high accuracy of 94 percent.

"This advanced machine learning algorithm is way faster and more accurate than any other approaches," says Dr. Zhao. "It will help doctors to pinpoint precise locations of diseased tissue in the upper chambers (atria) of the heart by creating a 3-D virtual heart within a minute.

"Current clinical treatment is unsatisfactory mainly due to a lack of understanding of the human atrial tissue which directly sustains AF," says Dr. Zhao. "This is a very important step towards much improved clinical diagnosis, patient stratification and clinical guidance during ablation treatment for patients with atrial fibrillation."

Artrial Fibrillation, leading to an irregular and rapid heart rate, is the most common sustained heart rhythm disturbance. At present, 25 per cent of the New Zealand population aged 40 and above will experience AF in their lifetime.

"With AF, our heart can not beat in a regular, effective fashion. Instead, it quivers, compromising the normal function of the heart to contract and pump blood throughout the whole body," says Dr. Zhao.

"More importantly, atrial fibrillation can lead to serious consequences including threefold increased risk of heart failure and fivefold increased

risk of stroke. In New Zealand, over 7,000 people every year have a stroke, 1 out of 5 strokes in people aged over 60 years is caused by atrial fibrillation. "

Provided by University of Auckland

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